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Effect of structural ordering on the physicochemical properties of oils

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Abstract

The relaxation times T 1a and T 2a, proton populations P i, and physicochemical parameters (dynamic viscosity η and density ρ) of oils were determined by using the pulse NMR in conjunction with modeling. A relationship between the relaxation times and the molecular weight and concentration of asphaltenes and resins was found. The dependences obtained showed kinks at η = 5-6 cP (ρ = 840-850 kg/m 3). A model of oil structure was proposed to explain the experimental results. The model was based on the assumption of a long-range order in oils. The viscosity was calculated by using a special radial distribution function R(r) = (1/n)ΣN kδ(r-r k)/4πr 2 k and a special pair potential U(r) = 4φ 0[(a/r-) 12 - Aexp(-αr)|cos(β r)|].